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ESTIMATED U.S. PETROLEUM BALANCE

SUMMARY

Petroleum products supplied rose 65 thousand B/D (0.4%) over year-earlier levels in October, as deliveries of kerosine jet fuel, distillates, and residual fuel oil registered advances while gasoline deliveries declined. The year-to-year comparison for total product deliveries suffers from the fact that October 1984 deliveries were well below the trend of preceding months, and that October 1985 deliveries, in fact, were down 150-200 thousand B/D below the recent-month deseasonalized trend, largely because of below-trend gasoline demand. For the year to date, gasoline and kerosine jet fuel deliveries were the only products on the plus side compared with the prior year's delivery levels.

Crude oil production rose in October, its 0.6% gain even with year-to-date performance; Alaskan output increases again exceeded production decreases in the lower 48. Imports continued to trail year-earlier levels, the year-to-year decrease in October, however, to a larger degree attributable to product imports rather than to crude purchases. Inventories were about 4 million barrels above estimated September levels, an increase less than half the historical inventory build for this time of year.

PRODUCTS SUPPLIED¹

Gasoline

**DOWN
SLIGHTLY
VERSUS
LAST YEAR.**

Deliveries of gasoline fell 14 thousand B/D (0.2%) in October, compared with last year's level. When added average blenders' volume, counted this year but not part of the reporting universe last year, is deducted — more than 50 thousand B/D on recently-revised basis — the year-to-year decrease deepens. In fact, a comparison of gasoline demand trends indicates that October delivery levels fell some 200 thousand B/D short of recent-months levels.

For the first 9 months of the year, year-to-year increases in gasoline deliveries had averaged about 140 thousand B/D, or roughly 2%, and even when adjusted for changes in the reporting population had been roughly 1 1/4%. The failure of October deliveries to continue that trend can only be in small part attributed to weather conditions in portions of the country late in the month. Real disposable income has undergone virtually no change since mid-summer, though it is estimated to be up a minimal 1% since last year (Sept. '84/Sept. '85). With the change in real gasoline prices minimal, this still leaves a sizable portion of the year-to-year decline largely unexplained, though delays in purchases for non-primary storage may have been a factor.

Despite a mid-month upturn, October's gasoline prices, on average, were still roughly 1/2¢ below September's. On an inflation-adjusted basis, they also continued to trail last year's levels.

Unleaded gasoline's market share, at almost 65%, stayed within the mid-sixties range that has now prevailed for several months.

An article dealing with the major factors that have contributed to recent-year changes in fuel efficiency — and thus in gasoline demand — appears in this issue.

Distillates

**3% DELIVERIES
INCREASE
OVER LAST
OCTOBER.**

Distillate deliveries increased 85 thousand B/D (3.1%) over October 1984 levels. While October weather was colder than last year, the effect of temperature deviations on distillate deliveries during a beginning-of-the-season month is small — perhaps only 20-30 thousand B/D for this October. In addition, holders of non-primary inventories may have resumed limited filling of their storage tanks in October. The resultant increase in deliveries is estimated to have

been in the 50-100 thousand B/D range. Rail traffic levels were slightly higher in October than last year, following several months of year-to-year declines. Judging by recent trends, truck traffic is estimated to have experienced a somewhat lesser year-to-year decrease than in prior months. The net decrease in deliveries attributable to October changes in these two sectors of the distillate market is estimated to have been about 40 thousand B/D.

Residual Fuel Oil

ALMOST 7% HIGHER THAN LAST OCTOBER'S LEVEL.

For only the second time this year, residual fuel oil deliveries were higher in October than a year ago, rising 71 thousand B/D (6.7%). October's delivery levels were 50-100 thousand B/D above recent-month trends. For the year to date, deliveries are still an estimated 196 thousand B/D (14.1%) lower than for the corresponding 1984 period.

Spot market transactions have been garnering an increasing share of the wholesale natural gas market and, in the process, apparently have been exerting growing influence on the direction of prices in the rest of the market. As a result, natural gas prices overall continued their downward drift in October. However, the size of their decline was considerably less than the drop in residual fuel oil prices, which fell \$2-3 per barrel from September levels to almost equal late-spring lows.

Deliveries of residual fuel oil to electric utilities are estimated to have been almost 200 thousand B/D below last year in August and may also have been below last year in September, as prices had strengthened considerably that month. However, with continuing year-to-year electric output increases combining with a substantial October resid price decrease, delivery levels may well have recovered in October, significantly reducing the year-to-year decline level. Similarly, the industrial sector, usually prompt to take advantage of swings in the relative prices of competing fuels because of substantial dual-fuel capability, may have experienced a slight year-to-year increase in October. Industrial production levels, while rising only minimally in recent months, are still more than 1% ahead of last year, giving a small boost to energy demand.

Bunker fuel deliveries, up about 10 thousand B/D, on average, for the first eight months of 1985 over the corresponding period last year, experienced sizable month-to-month swings, in part because of relative price fluctuations versus postings in other world ports. With prices down somewhat in October, we estimate that a small year-to-year improvement in demand occurred in October.

Kerosine Jet Fuel

ABOUT 3% HIGHER THAN LAST YEAR.

Kerosine jet fuel deliveries, again exceeding the 1 million B/D mark, were up 28 thousand B/D (2.8%) over last October. For the year to date, deliveries were about 19 thousand B/D (2.0%) ahead of last year.

For the first half of the year, year-to-year traffic increases averaged 3%-4%; however, strong air traffic levels lifted third-quarter "miles traveled" increases to the 4%-5% range, and similar traffic jumps are believed to have continued into October.

Other Oils

DOWN LESS THAN 1% VERSUS LAST YEAR.

We estimate that deliveries of "other oils" fell about 33 thousand B/D (0.8%) in October compared with year-earlier levels. The improving sales picture in the chemical industry in the second quarter did not carry through to the third quarter. Sales reportedly again fell substantially from prior-year levels. Petrochemical deliveries were some 30 thousand B/D below last year's for the first eight months of the year. While noticeable improvement occurred towards the end of that period with firming of overall economic activity, we estimate that September and October deliveries still did not exceed last year's levels.

LPG deliveries fell almost 7% from year-earlier levels in August, the latest month available. For the first eight months, however, deliveries of liquefied petroleum gases of about 1.56 million B/D were only marginally below last year. Natural gas liquids prices rose substantially in October from prior-month levels, reflecting strengthening demand. Demand for butanes has been increasing, mainly as a result of the lead reduction program. Ethane demand also appears to have been strong, with prices rising 20-25% during the past few weeks. Propane prices followed suit. In total we estimate that LPG deliveries were up about 75 thousand B/D in October.

Road oil and asphalt deliveries were almost 20 thousand B/D, or close to 5%, ahead of last year for the first eight months, apparently continuing to benefit from higher state and local budgetary allocations. Release of prior fiscal year's federal funds should by now have provided some greater impetus to asphalt and road oil sales, but there is as yet no evidence that this has occurred. We, therefore, estimate that October deliveries of asphalt rose only 20-25 thousand B/D over last year's.

Lubricants sales were up slightly in August but were still about 7% below last year for the first eight months of the year. Miscellaneous other products were also lower.

OCTOBER ESTIMATES

YEAR-TO-DATE ESTIMATES

(In millions of B/D)

	1985	1984	% Change	1985	1984	% Change
—Total domestic products supplied	15.7	15.6	0.4	15.7	15.8	(0.7)
—Motor gasoline supplied	6.7	6.7	(0.2)	6.8	6.7	1.9
—Distillate fuel oil supplied	2.9	2.8	3.1	2.8	2.8	(0.4)
—Residual fuel oil supplied	1.1	1.1	6.7	1.2	1.4	(14.1)

SUPPLY¹

Total supply was 504 thousand B/D below last year's, a 572 thousand B/D drop in imports being offset by a 68 thousand B/D increase in total domestic supply.

Production

0.6% HIGHER THAN LAST YEAR'S LEVEL.

Total October output was about 55 thousand B/D (0.6%) above last year's level. Production at Kuparuk, proceeding at a rate more than 100 thousand B/D over last year's, accounted for about 90% of the increase in total Alaskan production. Lower 48 output fell about 60 thousand B/D, in part because of precautionary measures to minimize damage from hurricane Juan in offshore Gulf of Mexico areas and abutting southern states.

Imports

10% LOWER THAN LAST OCTOBER.

Imports, though up about 6% in October from September levels, were 572 thousand B/D below last year.

Import levels, after recovering partly from early-year declines in April and May, had started to slide again during the summer months. About 60% of the October imports decline resulted from lower product purchases. Gasoline imports (including gasoline components), ahead of last year in past months, posted a roughly 95 thousand B/D decline in October, mainly because imports of gasoline blending components last October were much higher than the year's average. Distillate imports declined almost 175 thousand B/D. Distillate prices in European markets were higher than New York Harbor spot prices for most of the month but equal to or below N.Y. Harbor levels towards month-end. Residual fuel oil imports rose by about 65 thousand B/D in October, roughly paralleling the increase in domestic residual fuel oil deliveries.

Mexico continued to hold the No. 1 spot in the ranking of oil suppliers to the U.S. in August, the latest available month, with Canada, Venezuela, Indonesia, and the United Kingdom following in that order. The same ranking applies to total eight months 1985 imports. Imports from OPEC countries represented 37% of total imports in August and 34% for the first eight months of 1985. This compares with 40% and 38% for August and eight months of 1984, respectively.

Inventories

UP 4 MILLION BARRELS FROM SEPTEMBER LEVELS.

Inventories rose about 4 million barrels in October, less than half the historical increase for this time of year. Crude oil inventories stayed about the same, but distillate stocks rose 8 million barrels. Distillate production, while exceeding 3 million barrels per day during the last two weeks of October, averaged about 2.9 million barrels per day for the month as a whole, more than 200 thousand B/D higher than last year.

Inventories of "other oils" fell about 7 million barrels in October and were about 28 million barrels below year-earlier levels. Stocks of natural gas liquids and liquefied natural gases, a substantial portion of "other oils" inventories, were about 21 million barrels lower than last year in September, the last month for which data are available. No substantial change in that year-to-year gap is expected to have occurred in October.

Overall, inventories have been lower than last year for some time as a result of lower imports. Comparing changes in individual supply and demand elements for the past four months, for example (July-through-October of 1985 versus the corresponding 1984 period), it is clear that with changes in total demand (including exports) and domestic supply volumes nearly offsetting each other, the change in inventories is essentially equal to the year-to-year decline in imports.

Operations

UTILIZATION UP 3 1/2 PERCENTAGE POINTS.

Refinery utilization rose to more than 79% in October, a 3 1/2-percentage point increase over last year; input to distillation units was almost 270 thousand B/D higher and operable capacity down an estimated 370 thousand B/D.

An estimated 1.2 million barrels of capacity continues to be classified as idle but operable. If current input is related to capacity in actual operation, the utilization rate rises to about 86%.

(In millions of B/D)	OCTOBER ESTIMATES			YEAR-TO-DATE ESTIMATES		
	1985	1984	% Change	1985	1984	% Change
—Total supply	16.5	17.0	(3.0)	16.0	16.6	(3.1)
—Crude production ²	9.0	8.9	0.6	8.9	8.9	0.6
—Crude oil imports ^{1,4}	3.3	3.6	(6.3)	3.0	3.2	(9.2)
—Product imports	1.7	2.0	(17.1)	1.8	2.0	(13.7)

1. Total supply, i.e., production plus imports adjusted for net stock change is equal to total products supplied from primary storage. Total products supplied from primary storage less exports is equal to total domestic products supplied. Information contained in this report is derived from information published in the API Weekly Bulletin and is based on historical analysis of the industry. All data reflect the most current information available to the API and include all previously published revisions.

2. Includes lease condensate.

3. Beginning with January 1977, the U.S. Department of Energy began reporting crude oil imports as of the date of importation. Previously, this data, with the exception of Canadian crude imports, was reported as of the date it was received at the refinery. This change may affect both the level of crude oil imports and crude oil stocks. API estimates of these data may, therefore, differ slightly from those of the U.S. Department of Energy.

4. API data do not include crude oil imported for the Strategic Petroleum Reserve (SPR) nor crude oil stocks held in the SPR (according to the U.S. Department of Energy, the SPR held approximately 490 million barrels as of October 31, 1985).

ESTIMATED UNITED STATES PETROLEUM BALANCE

(Daily Average in Thousands of 42 Gallon Barrels)

Products Supplied/Supply From Primary Storage	OCTOBER			YEAR-TO-DATE		
	1985 ¹	1984 ²	% Change	1985 ^{3R}	1984 ²	% Change
Products Supplied:						
Total motor gasoline	6,715	6,729	(0.2)	6,822	6,696	1.9
Finished leaded motor gasoline*	2,366	2,636	(10.2)	2,461	2,752	(10.6)
Finished unleaded motor gasoline*	4,349	4,093	6.3	4,361	3,944	10.6
Naphtha-jet	211	222	(5.0)	217	225	(3.6)
Kerosine-jet	1,030	1,002	2.8	965	946	2.0
Distillate fuel oil	2,850	2,765	3.1	2,833	2,845	(0.4)
Residual fuel oil	1,137	1,066	6.7	1,193	1,389	(14.1)
All other oils ⁴	3,940	3,973	(0.8)	3,847	3,869	(0.6)
Reclassified ⁵	- 201	- 140	43.6	- 219	- 198	10.6
Total domestic products supplied	15,682	15,617	0.4	15,658	15,772	(0.7)
Exports	706	599	17.9	731	682	7.2
Total products supplied	16,388	16,216	1.1	16,389	16,454	(0.4)
Supply:						
Domestic production:						
Crude oil ⁶	8,961	8,906	0.6	8,921	8,867	0.6
Natural gas liquids	1,606	1,649	(2.6)	1,613	1,623	(0.6)
Other supply ⁷	944	888	6.3	809	789	2.5
Total domestic supply	11,511	11,443	0.6	11,343	11,279	0.6
Imports:						
Crude oil, total	3,340 ^{10/}	3,565 ^{10/}	(6.3)	2,951 ^{10/}	3,249 ^{10/}	(9.2)
Canadian	538	377	48.0	467	331	41.1
Other	2,782	3,188	(12.7)	2,484	2,918	(14.9)
Products, total	1,681	2,028	(17.1)	1,755	2,033	(13.7)
Residual fuel oil	528	461	14.5	493	696	(29.2)
Other	1,153	1,567	(26.4)	1,262	1,337	(5.6)
Total imports	5,021	5,593	(10.2)	4,706	5,282	(10.9)
Total supply	16,532	17,036	(3.0)	16,049	16,561	(3.1)
Stock change, all oils	+ 144	+ 820	XXXX	- 340	+ 107	XXXX
Refinery Operations						
Input to crude oil distillation units	12,418	12,151	2.3	12,087	12,237	(1.2)
Operable capacity	15,638	16,005	(2.3)	15,652	16,078	(2.6)
Refinery utilization (%) ⁸	79.4 ⁹	75.9 ⁹	4.6	77.2 ⁹	76.1 ⁹	1.4
Crude oil runs	12,289	11,978	2.6	11,942	12,067	(1.0)
Stocks (millions bbls.)	1985			1984 ⁷	% Change from	
	Oct., 31 ^{10/}	Sept., 30 ^{10/}	Oct., 31		Previous Month	Year Ago
Crude oil ^{10/}	316.7	316.1	343.0		0.2	(7.7)
Unfinished oils	107.7	103.4	111.1		4.2	(3.1)
Total motor gasoline**	213.8	221.0	232.4		(3.2)	(7.1)
Finished leaded motor gasoline*	72.1	76.6	84.0		(5.9)	(14.2)
Finished unleaded motor gasoline*	108.1	110.1	109.0		(1.8)	(0.8)
Naphtha-jet	6.4	6.4	6.5		-	(1.5)
Kerosine-jet	36.5	35.8	38.2		2.0	(4.5)
Distillate fuel oil	125.3	117.4	152.2		6.7	(17.7)
Residual fuel oil	49.1	44.2	50.8		11.1	(3.3)
All other oils	144.8	151.6 ⁹	172.9		(4.5)	(16.3)
Total all oils	1,002.3	997.9 ⁹	1,107.1		0.4	(9.5)

1) Based on API estimated data converted to a monthly basis.

2) Source: U.S. Department of Energy.

3) Source: January-August, U.S. Department of Energy; September-October, API.

4) Includes crude losses.

5) Beginning with January 1981, U.S. Department of Energy began using a new data collection system which encompasses a method to ascertain the amount of product reclassified during the production phase. So that there will be no double counting of these volumes, they are subtracted from total domestic products supplied.

6) Includes lease condensate.

7) Includes Unaccounted-for crude oil, Refinery input of other hydrocarbons, and Processing gain.

8) Represents "Input to crude oil distillation units" as a percent of "Operable capacity."

9) Derived by interpolating API weekly stocks data.

10) Data do not include oil imported for the Strategic Petroleum Reserve (SPR) nor crude oil stocks held in the SPR.

R: Revised.

* Included in motor gasoline.

** Includes finished leaded, finished unleaded, and motor gasoline blending components stocks.

THE DYNAMICS OF FUEL EFFICIENCY IMPROVEMENTS

Without the effects of improved fuel efficiency, the modest increase in gasoline demand of the last several years would have been much greater. Because of the important role this growing fleet efficiency has played in offsetting an improving economy and lower real gasoline prices, a closer examination of how new car fuel efficiency improvements, car sales, scrappage, and the age distribution of vehicles interact is of great interest. This article's conclusions are based on a model of how fuel efficiency improvements work their way through the vehicle fleet as new cars enter the fleet and older cars are scrapped. Though it incorporates several simplifying assumptions, the model proves useful in illustrating the relative effects that new car sales, scrapage, and improvements in new car efficiency have had on fleet performance as a whole.

BACKGROUND

For the first 10 months of 1985, motor gasoline supplied was about 1.1 percent ahead of the prior-year period, after adjustment for the larger 1985 reporting population. This continues the trend of 1983 and 1984 gains, which were 1.3 and 1.1 percent, respectively. Without fuel-efficiency improvements, higher income and lower prices would have raised gasoline supplied an estimated 13 percent from the first 10 months of 1982 to the corresponding 1985 period. The actual increase was less than 4 percent (adjusted for reporting population). The difference is largely attributable to the net effect of improved fuel efficiency, though there is a possibility (discussed further below) that the 1985 gasoline supplied data are understated. Figure 1 traces the path of EPA sales-weighted efficiencies of new cars by model year, 1975 to 1985. It should be noted that the EPA figures are widely recognized to be overstated; in fact, EPA now adjusts them downwards by about 15 percent. Figure 2 shows the average for the passenger car fleet as a whole as estimated by the Federal Highway Administration.

A number of questions can be raised about this improvement in fleet efficiency. For example, what are the relative contributions of new car sales, scrappage, and new-car efficiency improvements in determining the upward trend of the fleet average? How important are variations in sales and scrap rates in determining the rate of fleet improvement? Specifically, what has been the impact of the large increase in new car sales since 1982? To answer these questions, a model has been developed to illustrate how all of these factors have interrelated in the past and to show what would have happened to fleet efficiency had car sales, scrap rates, or efficiencies been higher or lower in recent years.

THE MODEL

The model focuses on the passenger car fleet, which consumes about two-thirds of motor gasoline sold. It begins with the passenger car fleet as distributed by model year in 1975. It steps through, year by year, subtracting scrappage by model years and adding new car sales for the most recent model years, thus arriving at the next year's fleet composition. When the historical sales and scrappage data pictured in Figure 3 are used, the model reproduces the historical age distribution of the 1975-1984 passenger car fleet and estimates the mid-1985 fleet composition. (Historical data through 1984 are from R.L. Polk and Company.) Each year, a vehicle-weighted fuel efficiency is calculated based on EPA sales-weighted averages. Changes in assumptions about sales, scrappage, and new car efficiency can be incorporated into the model to determine how each of these factors have influenced overall fleet efficiency.

To be consistent with the fleet composition data, which are as of mid-year, the sales and scrappage data are for periods beginning July 1 and ending June 30. For alternate cases, sales and scrappage are allocated to model years in the same proportions as the historical data. Since sales data are available for the 1984-85 period, but not scrappage data, vehicle retirements for this most recent period were allocated by the same proportions and with the same scrap-to-sales ratio as occurred in 1983-84.

Though the calculated fleet efficiencies are believed to be a reliable indicator of actual trends, several points should be made. First, the EPA ratings are widely recognized as being overstated, and in fact the EPA now adjusts them downward by about 15 percent; it is unlikely that the trend, as opposed to the level, is unduly distorted, however. Second, it is assumed that scrappage within a given model year is not biased towards more- or less-efficient vehicles.

Finally, the model calculates vehicle-weighted efficiency, not mileage-weighted efficiency. To the extent that older vehicles are driven less than newer ones, and that some models within a model year may travel more miles on average than others, vehicle-weighted and mileage-weighted figures will differ.

Some price effects are not incorporated because of this weighting scheme. For example, it is likely that changes in gasoline prices would bring about shifts between low- and high- efficiency vehicles in terms of both miles driven (through changes in driving habits and through vehicle resales) and scrappage rates within model years.

RESULTS

Figure 4 shows the increasing efficiency of the passenger car fleet as calculated by the model for the base case—that is, using historical sales and scrappage rates. The gain in efficiency has been running 3 to 4 percent per year in the last five years. The estimated level of fuel efficiency parallels, at a 9 to 11 percent higher level, that estimated by the Federal Highway Administra-

tion. The model estimates a 23 percent improvement, 1975 to 1983, the same as estimated by that agency. The model allows us to analyze the dynamics of this fleet improvement further.

The analysis is divided into three parts. In the first, the overall contributions of new car sales, scrappage, and improved new-car efficiency to the fleet average are derived. In the second, the effects on fleet efficiency of variations in car sales and scrappage within historical ranges are explored. The third section applies this to a specific case by analyzing the effects of higher car sales on fleet efficiency in the last three years.

Decomposition of fleet efficiency improvements. In order to segment the effects of car sales, scrappage, and current-year efficiency improvements, the model was modified so as to add in each of these factors one at a time as it steps through each year. Figure 5 shows the result. The largest contributor to the year-to-year fleet improvements has been new car sales, accounting for about two-thirds in recent years. Most of the remainder results from scrappage. Current-year efficiency improvements contribute relatively little in the short run, since it takes many years for the inventory of vehicles to turn over. Obviously, in the long run, the entire fleet improvement has come about because of the introduction of progressively more efficient vehicles. But, in the short run, the effect of already-achieved efficiencies working their way through the fleet has been the predominant source of year-to-year fleet efficiency improvement.

It is interesting to note that scrappage has gained an increasing share of the fleet efficiency improvements over the years. Figure 6 shows that the gap between the respective efficiencies of scrapped vehicles and the remaining fleet has grown, so that the impact of removing these cars from the fleet has grown as well. The figure also shows that the fleet average is still well below that of the latest model years.

Effects of variations in sales and scrappage. Over the last ten years, annual additions to the passenger car fleet have ranged from 8 million vehicles in 1981-82 to 11 million in 1978-79 (split-year basis), while scrap rates have ranged from 6.2 million in 1983-84 to 9.3 million in 1978-79. How large an impact can variations of this magnitude have? To find out, the model was run substituting these high and low values for 1984-85 sales and scrappage, respectively. The results show that the effect of these extreme variations is not large over the space of a year. An increase in new car sales from 8 to 11 million vehicles would have increased overall fleet efficiency by 0.1 miles per gallon. An increase in scrappage from 6.2 to 9.3 million cars would have had a similar effect. Both effects combined would have increased the fleet efficiency by only about 0.25 mpg, or a little more than 1 percent. Because of partially offsetting increases in miles travelled stemming from the reduction in cost per mile, the effect on gasoline demand would be less than this. Thus, though total sales and scrappage account for much of the fleet's efficiency gains in the short run, the short-run effects of even extreme variations in sales and scrappage may be noticeable but not large.

Effects of the sales increase since 1981-82. The effects of sales and scrappage variations might be expected to be larger over a longer time period. Has the 33 percent sales gain over the last three years had a measurable effect? To answer this question, the historical base case was compared to one in which sales and scrappage remained at their 1981-82 levels of 8 million and 7 million per year, respectively. This alternate case reduced mid-1985 fleet efficiency by 0.2 mpg, or about 1 percent, from the base case level. Again, even over a longer period, increased sales levels such as those experienced over the last three years have a noticeable but not large effect. This result, nevertheless, illustrates a seemingly perverse effect—that an improving economy, while enhancing gasoline demand through increased miles travelled and a growing vehicle fleet, has dampened it as well through increases in the average fleet efficiency.

IMPLICATIONS FOR GASOLINE DEMAND

For the first 10 months of 1985, data for motor gasoline supplied, after adjustment for the change in reporting population, show a gain of approximately 3½ percent over the same period of 1982. How does this figure compare with what would be indicated by economic data, price changes, and the trends in fleet efficiency estimated in this paper?

Over this span, real income rose about 13 percent while gasoline prices fell 16 percent in real terms. These factors are estimated to have had a positive influence on gasoline demand of about 13 percent. The model estimates an improvement in passenger car efficiency of a little less than 12 percent over this period; however, changes in truck efficiency must also be accounted for. Truck fleet efficiency, according to Federal Highway Administration data, showed little change in the most recent years available. If gasoline-powered trucks, which consume one-third of gasoline sales, are assumed to have shown minimal improvement in average efficiency in the past three years, the car and truck combined efficiency improvement falls to about 8 percent. After accounting for the partially offsetting increase in miles travelled because of the effective reduction in cost per mile, the net downward influence on gasoline supplied would be about 6 percent. The combined influence of these upward and downward forces indicates a 6½ percent increase in demand, rather than the 3½ percent reported above. The discrepancy amounts to about 175 MBD.

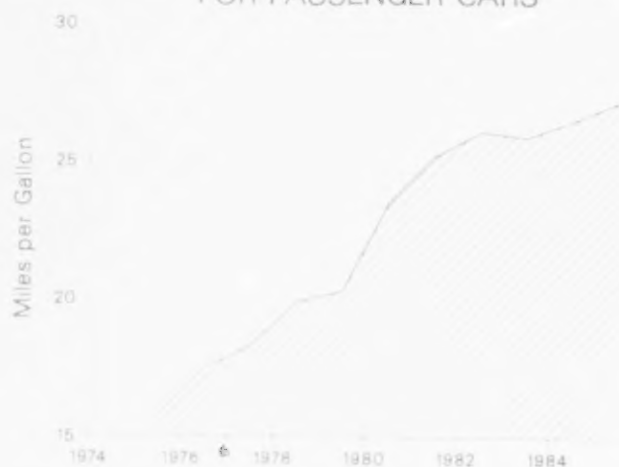
Liberalizing the assumption on truck efficiency improvements to half of that experienced by passenger cars yields an estimated 5 percent increase in gasoline demand, or a discrepancy from Department of Energy (DOE) data of about 80 MBD. Though these estimates are admittedly imprecise, they do indicate the possibility that DOE data are not capturing all gasoline consumption. Further analysis of fleet efficiency changes and economic data suggest that this difference began to be significant beginning with 1984, but did not deteriorate further in 1985. In fact, DOE added about 50 MBD in new respondents in 1985, so the 80-175 MBD discrepancy above is reduced to roughly 30 to 125 MBD. The possibility that DOE data have been understated is also suggested by a comparison of Federal Highway Administration data on gasoline sales with those of DOE. While in the previous three years DOE's figures have averaged about 185 MBD lower, in 1984 the gap increased to about 300 MBD.

An analysis of the 1984-85 change in gasoline demand, similar to that above, indicates no further deterioration, and perhaps an improvement, in DOE gasoline supplied data. The upward influence of price and income is estimated to have been about 160 MBD, while improved efficiency's net downward effect is estimated to be 140 to 180 MBD. On net, little change in gasoline demand is indicated, compared to a roughly 75 MBD increase based on DOE data. The latter figure excludes the effects of a known improvement in coverage — DOE's inclusion of new respondents in early 1985. This suggests that an improvement in coverage, in addition to the inclusion of these new respondents, may well have occurred compared to 1984.

CONCLUSION

The model of the U.S. car fleet described here shows that the major short-run contribution to fleet efficiency improvement in recent years has been vehicle turnover rather than efficiency improvements for the most recent model year. Large variations in car sales and scrappage have small but noticeable effects on a year-to-year basis, and the contribution of higher car sales in the past three years to improved fleet efficiency has not been large. The model, combined with other data, suggests that DOE gasoline supplied data may be understated.

Figure 1
EPA SALES-WEIGHTED AVERAGE FUEL EFFICIENCY
FOR PASSENGER CARS



Source: Environmental Protection Agency

Figure 2
AVERAGE FLEET FUEL EFFICIENCY, PASSENGER CARS
--FEDERAL HIGHWAY ADMINISTRATION



Source: Federal Highway Administration

Figure 3

REGISTRATIONS OF NEW CARS AND SCRAPPAGE



Note: figures are from mid-year to mid-year beginning with 1975-76
Sources: 1975-76 to 1983-84, R. L. Polk, 1984-85 estimated

Figure 4

ESTIMATED PASSENGER CAR FLEET EFFICIENCY (EPA BASIS)

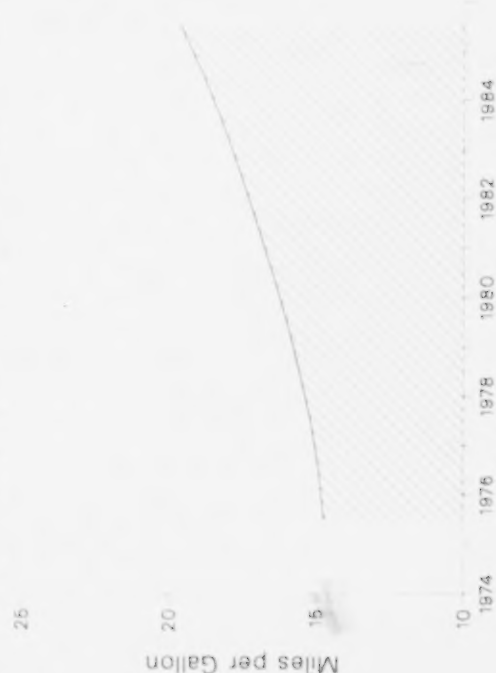


Figure 5

SEGMENTATION OF YEAR-TO-YEAR FLEET EFFICIENCY IMPROVEMENTS

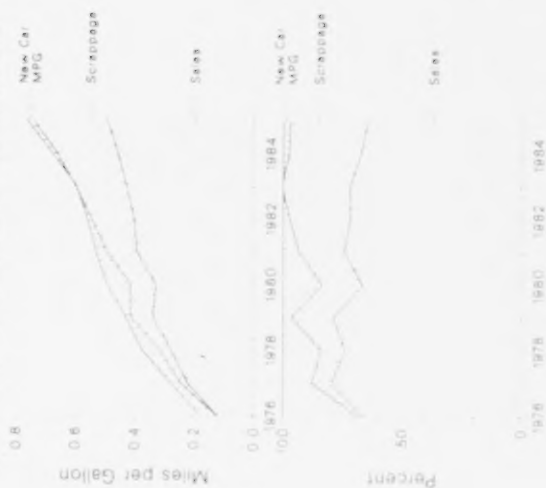


Figure 6

RELATIVE EFFICIENCIES OF NEW CARS, EXISTING FLEET, AND SCRAPPED VEHICLES

